

UNIVERSAL GARAGE DOOR OPERATING SYSTEM AND METHOD

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 The present invention relates to a universal system and method for use with a garage door operating system.

2. Background

10 Garage door operating systems are well known in the art. Such systems typically include at least one wireless transmitter and a garage door actuator. The actuator generally comprises an electric motor for driving a screw gear or chain to open or close a garage door. A receiver and controller are also typically provided for receiving signals from the wireless transmitter, and controlling the actuator.

15 In operation, in order to open or close the garage door, a user activates the transmitter. Upon such activation, the transmitter transmits a wireless, usually radio frequency (RF), signal to the receiver. In response, the controller activates the garage door actuator to open or close the garage door. For security purposes, the receiver may be manually set to recognize the transmitter, such as through switch settings, or the receiver may be pre-set to recognize an identification
20 signal from a particular transmitter. To further improve security, the wireless signal from the transmitter is also typically encrypted.

25 Wireless garage door transmitters from such systems are generally kept in a vehicle for use by a vehicle occupant to open or close the garage door in order to gain access to or depart from a garage. It is known in the automotive industry, however, to provide vehicles with wireless vehicle transmitters which can be used in place of, or in addition to, such garage door transmitters. However, such

transmitters, which may be built-in or mounted to the vehicle, must be taught to emulate the wireless garage door transmitter. Such a process requires placing the vehicle transmitter into a programming or learn mode, and using the garage door transmitter to tune the vehicle transmitter to the garage door transmitter. Such a process can prove complicated and difficult for many users.

Thus, there exists a need for a system and method for use with a garage door operating system that would overcome the problem of tuning a vehicle transmitter. Such a system and method would preferably include a control module for mounting in a garage having a garage door, the control module adapted to receive a wireless garage door transmitter. Such a module would preferably include a controller, a garage door transmitter actuator, and a receiver. Upon receipt by the receiver of a wireless signal from a vehicle transmitter, the controller would control the actuator to activate the garage door transmitter so that the garage door transmitter would transmit a wireless garage door control signal for use in operating a garage door. In such a fashion, such a system and method would overcome the vehicle transmitter tuning problem described above, and would be universally compatible with any garage door operating system.

SUMMARY OF THE INVENTION

Accordingly, an object of the present invention is to provide a universal system and method for use with a garage door operating system.

According to the present invention, then, for use with a garage door operating system comprising a wireless garage door transmitter, a system is provided for actuating the garage door transmitter. The system comprises a vehicle transmitter for transmitting a wireless garage door transmitter control signal, and a control module for mounting in a structure comprising a garage, the control module adapted to receive the garage door transmitter. The control module comprises a receiver for receiving the garage door transmitter control signal, a controller to be provided in communication with the receiver for generating a garage door transmitter actuator control signal in response to the garage door transmitter

control signal, and an actuator to be provided in communication with the controller, the actuator for actuating the garage door transmitter in response to the garage door actuator control signal so that the garage door transmitter transmits a wireless garage door control signal for use in operating a garage door.

5 According to the present invention, for use with a garage door operating system comprising a wireless garage door transmitter, a method is also provided for actuating the garage door transmitter. The method comprises providing a control module for mounting in a structure comprising a garage, the control module adapted to receive the garage door transmitter. The control module
10 comprises a receiver for receiving a wireless garage door transmitter control signal, a controller to be provided in communication with the receiver for generating a garage door transmitter actuator control signal in response to the garage door transmitter control signal, and an actuator to be provided in communication with the controller, the actuator for actuating the garage door transmitter in response to the
15 garage door actuator control signal so that the garage door transmitter transmits a wireless garage door control signal for use in operating a garage door.

 According to another embodiment of the present invention, for use with a garage door operating system comprising a wireless garage door transmitter, a system is provided for actuating the garage door transmitter. In this embodiment,
20 the system comprises a vehicle transceiver for receiving a wireless interrogation signal and automatically transmitting a wireless garage door transmitter control signal in response thereto, and a control module for mounting in a structure comprising a garage, the control module adapted to receive the garage door transmitter. The control module comprises a transceiver for automatically
25 transmitting the interrogation signal, and for receiving the garage door transmitter control signal, a controller to be provided in communication with the transceiver for generating a garage door transmitter actuator control signal in response to the garage door transmitter control signal, and an actuator to be provided in communication with the controller, the actuator for actuating the garage door transmitter in response
30 to the garage door actuator control signal so that the garage door transmitter transmits a wireless garage door control signal for use in operating a garage door.

According to this same embodiment of the present invention, for use with a garage door operating system comprising a wireless garage door transmitter, a method also provided for actuating the garage door transmitter. The method comprises providing a control module for mounting in a structure comprising a garage, the control module adapted to receive the garage door transmitter. The control module comprises a transceiver for automatically transmitting a wireless interrogation signal and for receiving a wireless garage door transmitter control signal, a controller to be provided in communication with the transceiver for generating a garage door transmitter actuator control signal in response to the garage door transmitter control signal, and an actuator to be provided in communication with the controller, the actuator for actuating the garage door transmitter in response to the garage door actuator control signal so that the garage door transmitter transmits a wireless garage door control signal for use in operating a garage door.

The preferred embodiments of the present invention are set forth in the following detailed descriptions thereof, including the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURES 1a and 1b are simplified, exemplary block diagrams including one embodiment of the system of the present invention;

FIGURES 2a and 2b are simplified, exemplary block diagrams including another embodiment of the system of the present invention;

FIGURE 3 is a simplified, exemplary flowchart of one embodiment of the method of the present invention; and

FIGURE 4 is a simplified, exemplary flowchart of another embodiment of the method of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

Referring now to the Figures, the preferred embodiments of the present invention will now be described in detail. As previously noted, garage door operating systems are well known in the art. Such systems typically include at least one wireless transmitter and a garage door actuator. The actuator generally comprises an electric motor for driving a screw or chain to open or close a garage door. A receiver and controller are also typically provided for receiving signals from the wireless transmitter, and controlling the actuator.

As also noted previously, in operation, in order to open or close the garage door, a user activates the transmitter. Upon such activation, the transmitter transmits a wireless, usually radio frequency (RF), signal to the receiver. In response, the controller activates the garage door actuator to open or close the garage door. For security purposes, the receiver may be manually set to recognize the transmitter, such as through switch settings, or the receiver may be pre-set to recognize an identification signal from a particular transmitter. To further improve security, the wireless signal from the transmitter is also typically encrypted.

Such wireless garage door transmitters are generally kept in a vehicle for use by a vehicle occupant to open or close the garage door in order to gain access to or depart from a garage. It is known in the automotive industry, however, to provide vehicles with wireless vehicle transmitters which can be used in place of, or in addition to, such garage door transmitters. However, such transmitters, which may be built-in or mounted to the vehicle, must be taught to emulate the wireless garage door transmitter. Such a process requires placing the vehicle transmitter into a programming or learn mode, and using the garage door transmitter to tune the vehicle transmitter to the garage door transmitter. Such a process can prove complicated and difficult for many users.

Thus, there exists a need for a system and method for use with a garage door operating system that would overcome the problem of tuning a vehicle transmitter. Such a system and method would preferably include a control module

for mounting in a garage having a garage door, the control module adapted to receive a wireless garage door transmitter. Such a module would preferably include a controller, a garage door transmitter actuator, and a receiver. Upon receipt by the receiver of a wireless signal from a vehicle transmitter, the controller would control the actuator to activate the garage door transmitter so that the garage door transmitter would transmits a garage door control signal for use in operating a garage door. In such a fashion, such a system and method would overcome the vehicle transmitter tuning problem described above, and would be universal in nature.

Referring now to Figures 1a and 1b, simplified, exemplary block diagrams including one embodiment of the system of the present invention are shown. As seen in Figure 1a, the system comprises a control module (10). Control module (10) is adapted for mounting on a wall (18), such as inside a garage (20) having a garage door (22). It should be noted, however, that control module (10) could alternatively be mounted elsewhere, such as on ceiling (24) in garage (20) or at any other location in garage (20) or other structure, such as an attached house (not shown). In that regard, control module (10) is preferably provided on one surface thereof with an adhesive (not shown) suitable for binding control module (10) to wall (18) or ceiling (24). Alternatively, any means known in the art suitable for mounting control module (10) to wall (18) or ceiling (24), such as screws (not shown), may also be used.

As seen in Figure 1b, control module (10) preferably comprises a receiver (12) provided in communication with a controller (14), which is in turn provided in communication with an actuator (16). Controller (14) preferably comprises a microprocessor, although any equivalent thereof may also be used. Actuator (16) preferably comprises a solenoid, although again any suitable equivalent may also be used. Control module (10) is adapted to receive and hold a wireless garage door transmitter (26), which is part of and adapted for use in a garage door operating system (28) for operating garage door (22). In that regard, as seen in both Figures 1a and 1b, garage door transmitter (26) is placed by a user in a housing or receptacle (29) in control module (10) adapted for that purpose.

As is well known in the art, garage door transmitter (26) includes an activation button (30) which, when depressed by a user, activates garage door transmitter (26) to transmit a wireless garage door control signal (32). As previously described, garage door operating system (28) includes a receiver (34),
5 controller (36) and garage door actuator (38). Upon receipt by receiver (34) of garage door control signal (32) from garage door transmitter (26), controller (36) controls garage door actuator (38) to open or close garage door (22).

As seen in Figure 1a, a vehicle (40) includes a vehicle transmitter (42). Vehicle transmitter (42) is preferably mounted or built-in vehicle (40).
10 Alternatively, vehicle transmitter (42) could be a wireless transmitter provided with vehicle (40), such as in the form of a well-known key-fob (not shown). Vehicle transmitter (42) may be designed for manual activation by a vehicle occupant (not shown) to transmit a wireless control signal (44) for use in activating garage door transmitter (26) (i.e., "active"), or may be designed to at least periodically
15 automatically transmit control signal (44) (i.e., "passive").

In either case, receiver (12) receives garage door transmitter control signal (44) from vehicle transmitter (42). In response thereto, controller (14) generates a garage door transmitter actuator control signal (not shown), which activates actuator (16). In that regard, upon placement of garage door transmitter
20 (26) in receptacle (29) of control module (10), actuator (16) is preferably selectively moveable by a user in order to position actuator (16) adjacent activation button (30) of garage door transmitter (26). Upon activation by the actuator control signal, actuator (16) thus depresses activation button (30) of garage door transmitter (26), thereby causing garage door transmitter (26) to transmit wireless garage door
25 control signal (32). As described above, the transmission of garage door control signal (32) then effects the opening or closing of garage door (22).

It should be noted here that where vehicle transmitter (42) automatically transmits garage door transmitter control signal (44), controller (14) preferably determines a signal strength of garage door transmitter control signal (44)
30 and generates a garage door transmitter actuator control signal to activate actuator

(16) only when the signal strength of garage door transmitter control signal (44) exceeds a selected threshold. In such a fashion, garage door (22) is opened or closed only when vehicle (40) is within a selected proximity to garage door (22).

5 Referring now to Figures 2a and 2b, simplified, exemplary block diagrams including another embodiment of the system of the present invention are shown. In that regard, the block diagrams of Figures 2a and 2b include many of the same components as depicted in Figures 1a and 1b, which components are denoted in Figures 2a and 2b using like numerals.

10 As seen in Figure 2a, the system includes a control module (10). As described above in connection with Figure 1a, control module (10) is again adapted for mounting on a wall (18), such as inside a garage (20) having a garage door (22). It should be noted again, however, that control module (10) could alternatively be mounted elsewhere, such as on ceiling (24) in garage (20) or at any other location in garage (20) or other structure, such as an attached house (not shown). In that
15 regard, control module (10) is preferably provided on one surface thereof with an adhesive (not shown) suitable for binding control module (10) to wall (18) or ceiling (24). Alternatively, any means known in the art suitable for mounting control module (10) to wall (18) or ceiling (24), such as screws (not shown), may also be used.

20 As seen in Figure 2b, control module (10) preferably comprises a transceiver (46) provided in communication with a controller (14), which is in turn provided in communication with an actuator (16). Controller (14) again preferably comprises a microprocessor, although any equivalent thereof may also be used. Actuator (16) again preferably comprises a solenoid, although again any suitable
25 equivalent may also be used. Control module (10) is again adapted to receive and hold a wireless garage door transmitter (26), which is part of and adapted for use in a garage door operating system (28). Once again, as seen in both Figures 2a and 2b, garage door transmitter (26) is placed by a user in a housing or receptacle (29) in control module (10) adapted for that purpose.

As previously described, such a garage door transmitter (26) includes at least one activation button (30) which, when depressed by a user, activates garage door transmitter (26) to transmit a wireless garage door control signal (32). As also previously described, garage door operating system (28) includes a receiver (34),
5 controller (36) and garage door actuator (38). Upon receipt by receiver (34) of garage door operating signal (32) from garage door transmitter (26), controller (36) controls garage door actuator (38) to open or close garage door (22).

As seen in Figure 2a, a vehicle (40) includes a vehicle transceiver (48). Vehicle transceiver (48) is preferably mounted or built-in vehicle (40).
10 Alternatively, vehicle transceiver (48) could be a wireless transceiver provided with vehicle (40), such as in the form of a well-known key-fob (not shown). In operation, controller (14) causes transceiver (46) to at least periodically automatically transmit a wireless interrogation signal (50), which is received by vehicle transceiver (48). In response to the receipt of interrogation signal (50),
15 vehicle transceiver (48) transmit a wireless garage door transmitter control signal (44) for use in activating garage door transmitter (26).

Garage door transmitter control signal (44) is received by transceiver (46). In response to receipt by transceiver (46) of garage door transmitter control signal (44), controller (14) generates a garage door transmitter actuator control
20 signal (not shown), which activates actuator (16). In that regard, upon placement of garage door transmitter (26) in receptacle (29) of control module (10), actuator (16) is again preferably selectively moveable by a user in order to position actuator (16) adjacent activation button (30) of garage door transmitter (26). Upon activation by the actuator control signal, actuator (16) thus depresses activation button (30),
25 thereby causing garage door transmitter (26) to transmit wireless garage door control signal (32). As described above, the transmission of garage door control signal (32) then effects the opening or closing of garage door (22).

As previously described, controller (14) preferably determines a signal strength of garage door transmitter control signal (44) and generates a garage
30 door transmitter actuator control signal to activate actuator (16) only when the signal

strength of garage door transmitter control signal (44) exceeds a selected threshold. Alternatively, vehicle transceiver (48) may determine a signal strength of interrogation signal (50) and transmit garage door transmitter control signal (44) only when the signal strength of interrogation signal (50) exceeds a selected
5 threshold. In either fashion, garage door (22) is opened or closed only when vehicle (40) is within a selected proximity of garage door (22).

In either of the embodiments depicted in Figures 1a-b and 2a-b, for improved security, garage door transmitter control signal (44) preferably includes an identification code. Controller (14) determines if the identification code in
10 garage door transmitter control signal (44) is valid, and generates a garage door transmitter actuator control signal to activate actuator (16) only if the identification code is determined valid. Similarly, to further improve security, garage door transmitter control signal (44) is preferably encrypted by vehicle transmitter (42) or vehicle transceiver (46), and decrypted by controller (14). In that same regard,
15 interrogation signal (50) may also be encrypted and decrypted by controller (14) and vehicle transceiver (46), respectively.

As seen in Figures 1a-b and 2a-b, in both embodiments, control module (10) may be provided with electrical power using a conventional household power outlet (52) and plug (54). In that regard, a transformer (not shown) is
20 preferably provided to convert AC power from outlet (52) to DC power. Alternatively, control module (10) may be provided with electrical power using one or more suitable batteries (not shown).

Referring now to Figure 3, a simplified, exemplary flowchart of one embodiment of the method of the present invention is shown, denoted generally by
25 reference numeral 60. The method (60) of the present invention is for use with a garage door operating system comprising a wireless garage door transmitter. The method (60) comprises providing (62) a control module for mounting in a structure comprising a garage, the control module adapted to receive the garage door transmitter. The control module comprises a receiver for receiving a wireless
30 garage door transmitter control signal, a controller to be provided in communication

with the receiver for generating a garage door transmitter actuator control signal in response to the garage door transmitter control signal, and an actuator to be provided in communication with the controller, the actuator for actuating the garage door transmitter in response to the garage door actuator control signal so that the
5 garage door transmitter transmits a wireless garage door control signal for use in operating a garage door. The method (60) may further comprise providing (64) a vehicle transmitter for transmitting the garage door transmitter control signal.

As described in detail above, the vehicle transmitter is preferably built-in or mounted in the vehicle, and may be automatic or for activation by a
10 vehicle occupant. The control module may be battery powered, or provided with power from a household outlet. As also previously described in detail, the actuator preferably comprises a solenoid, the garage door transmitter includes a transmitter activation button, and the solenoid is adapted to be positioned adjacent the transmitter activation button. Still further, the garage door transmitter control signal
15 preferably includes an identification code, and the controller determines if the identification code is valid and generates the garage door transmitter actuator control signal in response to the garage door transmitter control signal only if the identification code is determined valid. In addition, the garage door transmitter control signal is preferably encrypted, and the vehicle transmitter is adapted to
20 encrypt the garage door transmitter control signal and the controller is adapted to decrypt the garage door transmitter control signal.

Referring now to Figure 4, a simplified, exemplary flowchart of another embodiment of the method of the present invention is shown, denoted generally by reference numeral 70. The method (70) of the present invention is for
25 use with a garage door operating system comprising a wireless garage door transmitter. The method (70) comprises providing (72) a control module for mounting in a structure comprising a garage, the control module adapted to receive the garage door transmitter. The control module comprises a transceiver for automatically transmitting a wireless interrogation signal and for receiving a
30 wireless garage door transmitter control signal, a controller to be provided in communication with the transceiver for generating a garage door transmitter actuator

control signal in response to the garage door transmitter control signal, and an actuator to be provided in communication with the controller, the actuator for actuating the garage door transmitter in response to the garage door actuator control signal so that the garage door transmitter transmits a wireless garage door control signal for use in operating a garage door. The method may further comprise providing (74) a vehicle transceiver for receiving the interrogation signal and automatically transmitting the garage door transmitter control signal in response thereto.

As described in detail above, the vehicle transceiver is preferably built-in or mounted in the vehicle. The control module may be battery powered, or provided with power from a household outlet. As also previously described in detail, the actuator preferably comprises a solenoid, the garage door transmitter includes a transmitter activation button, and the solenoid is adapted to be positioned adjacent the transmitter activation button. Still further, the garage door transmitter control signal preferably includes an identification code, and the controller determines if the identification code is valid and generates the garage door transmitter actuator control signal in response to the garage door transmitter control signal only if the identification code is determined valid. In addition, the garage door transmitter control signal is preferably encrypted, and the vehicle transceiver is adapted to encrypt the garage door transmitter control signal and the controller is adapted to decrypt the garage door transmitter control signal.

It should be noted that the simplified flowcharts depicted in Figures 3 and 4 are exemplary of the method of the present invention. In that regard, the steps of such method may be executed in sequences other than those shown in Figures 3 and 4, including the execution of one or more steps simultaneously.

As is readily apparent from the foregoing detailed description, the present invention provides a universal system and method for use with a garage door operating system that overcomes the previously described problem of tuning a vehicle transmitter. The system and method of the present invention preferably include a control module for mounting in a garage having a garage door, the control

module adapted to receive a wireless garage door transmitter. The module preferably includes a controller, a garage door transmitter actuator, and a receiver. Upon receipt by the receiver of a wireless signal from a vehicle transmitter, the controller controls the actuator to activate the garage door transmitter so that the garage door transmitter transmits a wireless garage door control signal for use in operating a garage door. In such a fashion, the system and method of the present invention overcome the vehicle transmitter tuning problem associated with the prior art, and are universally compatible with any garage door operating system. It should also be noted that the system and method of the present invention may be adapted to work with commercially available home automation software to actuate other wireless control devices or switches for operating other household systems such as, for example, lights or air conditioning units.

While embodiments of the invention have been illustrated and described, it is not intended that these embodiments illustrate and describe all possible forms of the invention. Rather, the words used in the specification are words of description rather than limitation, and it is understood that various changes may be made without departing from the spirit and scope of the invention.